REPLACING PAGE ADDENDUM
Filing Instructions:
1. REMOVE FROM THE SECTION THE PAGES NUMBERED THE SAME AS THOSE ATTACHED TO THIS PINK SHEET.
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PANEL SELECTOR COMMUTATORS AND COMMUTATOR BRUSHES REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.001 This addendum supplements Section 026-120-701, Issue 5. The attached pages must be inserted in the section in accordance with the filing instructions above.

1.002 This addendum is reissued to revise Part 2 and Part 3.

2. REQUIREMENTS

The following changes apply to Part 2 of the Section:

(a) 2.01(d)—revised

(b) 2.07(d)—note added

(c) Fig. 66, 67, 68, 69, 70, and 71 to show revised limits of adjustments of C commutator spring.

3. ADJUSTING PROCEDURES

The following change applies to Part 3 of the Section:

(a) 3.01 (1)—revised.

Attached:

Page 1 dated March 1963, reissued

Page 2 dated March 1963, revised

Page 3 dated July 1971, reissued

Page 4 dated July 1971, revised

Page 25 dated January 1970, revised

Page 26 dated January 1970, revised

Page 29 dated March 1963, revised

Page 30 dated March 1963, reissued

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PANEL SELECTOR COMMUTATORS AND COMMUTATOR BRUSHES REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers panel selector commutators and commutator brushes (1-, 2-, 3-, 4-, 5-, 6-, 7-, and 10-type commutators and 10- and 14-type commutator brushes).

1.02 This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.

1.03** ***Asterisk (*): Requirements are marked with an asterisk when to check for them would necessitate dismantling or dismounting of apparatus, or would affect the adjustment involved or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons or its performance indicates that such a check is advisable.

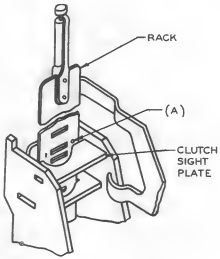

Fig. 1—Rack Notch Number

1.04 Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for the proper application of the requirements listed herein.

1.05 ***Commutator Segment:*** A commutator segment is the metallic surface of a contact strip over which a commutator brush rides between two consecutive insulating portions of the commutator. The vertical metallic connecting portions between the narrow segments are the side edges of the contact strip and are used for the electrical connections between segments but are not part of the segments.

1.06 ***Rack Notch Number:*** Fig. 1(A)—This is the number specified to indicate the position at which the rack must rest on the clutch pawl when a requirement is checked or the corresponding readjustment made. Unless otherwise specified, to set the rack on the pawl at the desired notch, the rack notch number specified must appear just above the clutch sight plate. The illustration shows the position of the rack when the rack notch number specified is 10.

1.07 The 10- and 14-type commutator brushes are solid, split, or forked, as covered in the following table.

10 type—All springs solid.

No. 14A,B,E—All springs either split leaf or forked except C brush which is solid.

No. 14C—All springs either split or forked.

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1.08 ***Make-busy Information:*** Before making any of the inspections or readjustments covered in this section, make busy the associated circuit and the two adjacent circuits in the approved manner, and, if necessary, block the relays operated or nonoperated to permit raising the brush rod.

1.09 ***Commutator Brushes of Link Circuits Installed on a Brush Rod Equipped With Nontripping-type Multiple Brushes:*** Before checking for contact or wiper pad pressure or for clearance between brush springs and wiper, or before making any readjustments of a commutator brush of a link circuit having nontripping-type multiple brushes, proceed as follows. Separate the springs of each multiple brush on the rod so they will not contact the multiple bank terminals, as covered in 3.002. This will prevent interference with working circuits connected to the multiple bank terminals.

2. REQUIREMENTS

2.01 ***Cleaning and Treating***

Commutator Brushes Not Equipped With Wiper Holders

(a) ***Before Turnover:*** Commutators shall be cleaned and treated according to approved procedures.

(b) ***After Turnover:*** Commutators shall be cleaned and treated periodically, as required, by local conditions.

Caution: Commutators used in high usage circuits and first choice selector circuits require more frequent treating than others.

Commutator Brushes Prior to Initially Mounting Wiper Holders

(c) Clean the commutator. Do not use oiled cloths on commutators to be equipped with wiper holders.

Commutator Brushes Equipped With Wiper Holders

(d) ⏵The P-15A301 or P-13B114 wiper pads shall be used in a wiper holder and shall be replaced periodically.⏴

(e) When replacing wiper pads or when circuit conditions indicate that cleaning is required, the commutator should be cleaned.

Recommended intervals

(f) It is recommended that the wiper pad be replaced annually unless local conditions require their replacement at more frequent intervals.

2.02 ***Commutator Mounting:*** Fig. 2(A)—The commutator retaining spring and the commutator latch plate shall hold the commutator firmly at top and bottom. Sideplay is permissible at the bottom.

Gauge by feel.

Commutator Brush

*2.03 ***Commutator Brush Mounting:*** The commutator brush mounting screws shall hold the brushes securely in place and shall be flush or underflush with the inner surface of the brush frame.

2.04 ***Spring Clearance (For Earlier Split Leaf Springs Only):*** Fig. 2(B)—The two leaves shall not bind on each other when either of the leaves is lifted away from the commutator and allowed to return.

Gauge by feel and by eye.

To check this requirement lift one leaf away from the commutator with the KS-6320 orange stick and note whether the other leaf is lifted from the commutator. Then release the leaf and note whether it returns freely to its original position.

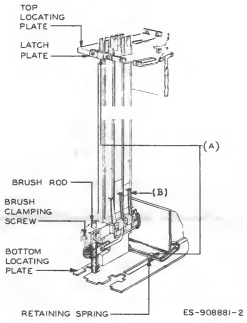


Fig. 2—Mounting of Commutator

2.05 ***Horizontal Position of Springs:*** Fig. 3 and 5(A)

(a) There shall be a clearance between the contact portion of the lip of the brush springs and front and rear edge of each segment when the play of the commutator brush assembly is taken up in either direction for any position of travel of the commutator brush.

Gauge by eye.

(b) Fig. 4(A)—***On No. 4A, 4B, 4C, and 3U commutators*** there shall be a clearance between the front edge of the brush spring and the front edge of the X segment when the play between the brush assembly and the commutator is taken up in the adverse direction.

Gauge by eye.

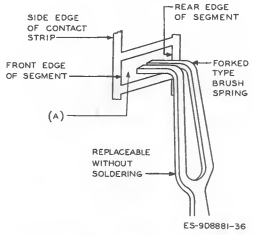


Fig. 3—Horizontal Position of Springs

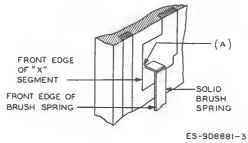


Fig. 4—Horizontal Position of Brush Spring on No. 4A, 4B, 4C, and 3U Commutators

2.06 ***Angle of Contact:*** Fig. 6(A)—The contact portion of the lip of the commutator brush spring shall meet the face of the commuta or strip within 0.016 inch (springs are approximat y 0.016 inch thick, approximately 0.012 inch for single leaf 14-type springs) of the point at which the horizontal portion or lip of the brush spring would be perpendicular to the face of the commutator strip.

Gauge by eye.

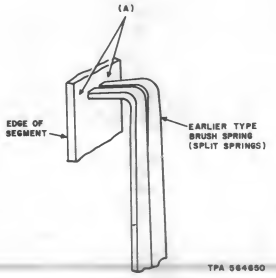


Fig. 5—Horizontal Position of Springs

2.07 ***Vertical Position of Springs:*** The contact portion of the lip of each spring shall set against the commutator within the limits specified on

Pages 7, 8	District and 3-wire Office Frames
Page 9	District Office Frames
Pages 10 to 14	Incoming Frames
Pages 15 to 17	Final Frames
Pages 18 to 20	B Link Frames
Pages 21, 22	Translator Frames
Pages 23, 24	Line Finder and Trunk Finder Frames
Pages 25, 26	Subscriber Link Frames
Page 27	Sender Tandem Link Frames

(a) ***In the case of split and forked springs,*** the requirements specified must be met with both leaves or halves of the springs, that is, both leaves or halves must be within the limits specified, although one leaf or half may approach the maximum limit while the other leaf or half approaches the minimum limit.

Gauge by eye.

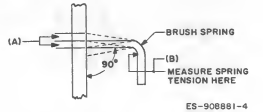


Fig. 6—Contact Angle of Brush with Commutator

(b) Fig. 7(A)—***C springs of all brushes*** shall be so adjusted that the full width of the contact portion of the spring (or of each leaf in the case of the split springs or each half of the spring in the case of forked springs) comes within the specified limits as covered in (d).

Gauge by eye.

(c) Fig. 7(B)—***All commutator springs except the C springs*** are satisfactorily adjusted for position, if at a point in the middle of the contact portion of the spring (of each leaf, in the case of a split spring and each half of the spring in the case of forked springs) it is within the specified limits as covered in (d).

(d) These limits shall be measured from the top edge or from the bottom edge of the contact portion of the spring to the top edge or the bottom edge of the corresponding commutator segment as indicated in the tables of limits on pages 7 to 27. Adjustments shall always be made either with the brush rod resting on the associated pawl in the notch of the rack specified in the table, or with the rod in the normal (down) position, as specified.

Gauge by eye.

Note: The G spring is always in contact with its segment and should be adjusted to the mean height of the other springs.

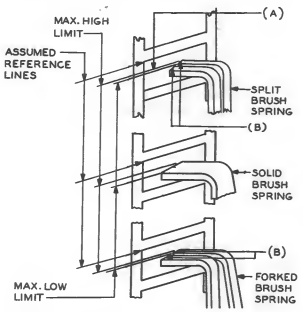


Fig. 7 – Vertical Position of Brush Springs

2.08 ***Contact Pressure:*** Fig. 6(B) — The contact pressure of each solid spring, or of each leaf in the case of split springs or of each half of the spring in the case of forked-type springs and the commutator segment shall be

Test — Min 25 grams
Max 55 grams

Readjust — Min 30 grams
Max 55 grams

Use the No. 68B gauge.

Before checking the requirement make sure that the brush assembly is correctly located on the brush rod and the springs are not badly bent or distorted.

Measure the pressure just below the horizontal portion or lip with the brush rod in the portion corresponding to the reference terminal of the bank.

2.09 ***Clearance Between Brush Springs and Wiper Holder:*** Fig. 8(A) — With the pads removed, there shall be a clearance between the brush springs and the adjacent metal portion of the wiper holder of

Min 1/32 inch

Gauge by eye.

To check this requirement, proceed as follows. Move the wiper holder to one side. Remove the wiper pad using the P-long-nose pliers. Take care when deflecting the wiper holder and removing the pad not to move the holder more than necessary, as this might reduce the tension of the holder. Release the holder and check the clearance between the brush springs and the holder.

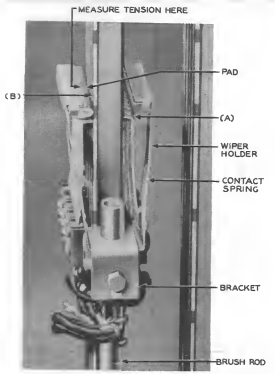


Fig. 8 – Pad Pressure and Brush Spring Clearance

This may be facilitated if a piece of white paper is placed behind the commutator and a light is shone on the paper. After checking the requirement, remount the wiper pad in the wiper holder taking the precautions covered above.

2.10 ***Pressure of Wiper Pad Against Commutator:*** Fig. 8(B) — The pressure of the wiper pad against the commutator measured at the center of the wiper holder shall be

Min 30 grams
Max 50 grams

Use the No. 68B gauge.

To check this requirement, apply the gauge to the wiper holder just above the embossing as shown in Fig. 9.

2.11 ***Movement of Ends of Wiper Holder:*** When pressure is applied to one end of the wiper holder to deflect it from the pad, there shall be movement at the other end of the wiper holder.

Gauge by eye and feel.

To check this requirement, press each end of the wiper holder in turn toward the commutator using the KS-6320 orange stick. Note that there is movement at each end.

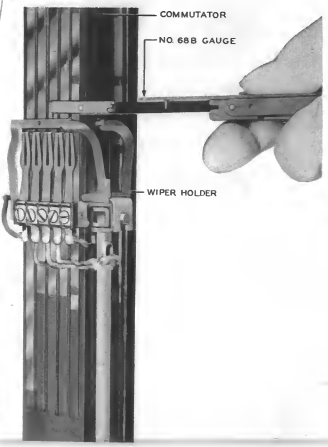


Fig. 9 – Method of Applying No. 68B Gauge

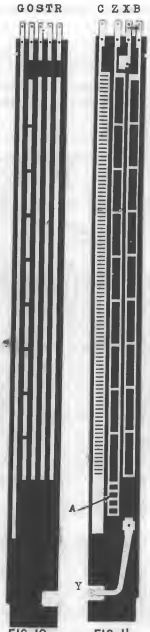


FIG. 10 FIG. 11

No. 1D COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	ABOVE	BOTTOM	5TH	43		.010"	.020"
C	TOP	COINCIDE	BOTTOM	45TH	43	.004"		.004"
O	TOP	BELOW	BOTTOM	EACH SEGMENT	10,21,32, 43,54,65, 76,87 & 99		EQUAL	§
	BOTTOM	ABOVE	TOP			§		
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99	† NO.0		NO.99

NO. 1D COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	ABOVE	BOTTOM	5TH	43		.010"	.020"
C	TOP	COINCIDE	BOTTOM	45TH	43	.004"		.004"
O	TOP	BELOW	BOTTOM	EACH SEGMENT	10,21,32, 43,54,65, 76,87,93 & 99		EQUAL	§
	BOTTOM	ABOVE	TOP			§		
T R S	BOTTOM	ABOVE	BOTTOM	-	0			
	TOP	BELOW	TOP	-	99	† NO.0		NO.99

NOS. 3D AND 3AA COMMUTATORS

Note A: As an aid in meeting these limits, the brush springs may be used as a reference. The thickness of the 10 and 14 type brushes used respectively for 1 and 3 type commutators is approx. .016" except for the solid brush spring of 14 type brushes which is approx. .012"

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

§ Spring shall not touch segment. † Spring shall not touch insulation.

DISTRICT AND ☿ WIRE OFFICE FRAMES

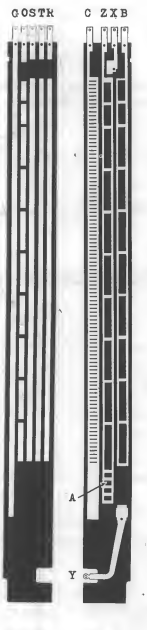


FIG. 12 FIG. 13

NOS. 3D AND 3AA COMMUTATORS

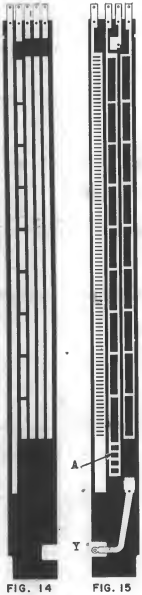


FIG. 14 FIG. 15

NOS. 3H AND 3AC COMMUTATORS

SPRING DESIG.	SPRING EDGE	SPRING POSITION	SEGMENT EDGE	SEGMENT NUMBER	RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	ABOVE	BOTTOM	5TH	43	.010"	.020"	
C	TOP	COINCIDE	BOTTOM	45TH	43	.004"		.004"
O	TOP	BELOW	BOTTOM	EACH SEGMENT	10,21,32, 43,54,65, 76,87,& 99	EQUAL		§
	BOTTOM	ABOVE	TOP					
T R S	BOTTOM	ABOVE	BOTTOM	—	0	NO.0		NO.99
	TOP	BELOW	TOP	—	99			

NOS. 3H AND 3AC COMMUTATORS

SPRING DESIG.	SPRING EDGE	SPRING POSITION	SEGMENT EDGE	SEGMENT NUMBER	RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	ABOVE	BOTTOM	5TH	43	.010"	.020"	
CW	TOP	COINCIDE	BOTTOM		43	.004"		.004"
	TOP	BELOW	BOTTOM	1ST	SEE NOTE C BELOW			.032"
O	TOP	BELOW	BOTTOM	EACH SEGMENT	10,21,32, 43,54,65, 76,87,93 & 99	EQUAL		§
	BOTTOM	ABOVE	TOP					
T R S	BOTTOM	ABOVE	BOTTOM	—	0	NO.0		NO.99
	TOP	BELOW	TOP	—	99			

NOS. 3T AND 3AB COMMUTATORS

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

Note C: Check or adjust the "W" spring with the brush rod normal (resting on the down stop collar).

§ Spring shall not touch segment. † Spring shall not touch insulation.

DISTRICT AND 3 WIRE OFFICE FRAMES

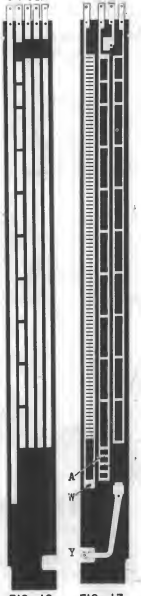


FIG. 16 FIG. 17

NOS. 3T AND 3AB COMMUTATORS

FIG. 18

NO. 3Y COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	COINCIDE	TOP	5TH	SEE NOTE B BELOW	.004"		.004"
B	BOTTOM	COINCIDE	BOTTOM	5TH	42	.004"		.004"
C	TOP	COINCIDE	BOTTOM	44TH	42	.004"		.004"
0	TOP	BELOW	BOTTOM	EACH SEGMENT	10,21,32, 43,54,65, 76,87,93, & 99	§	EQUAL	§
	BOTTOM	ABOVE	TOP					
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO.0		NO.99
	TOP	BELOW	TOP	-	99			

NO. 3Y (FORMERLY D-76953) COMMUTATOR

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

§ Spring shall not touch segment. ‡ Spring shall not touch insulation.

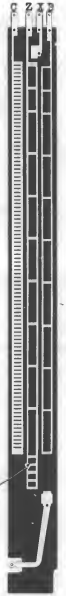


FIG. 19

NO. 3Y COMMUTATOR

DISTANT OFFICE FRAMES

FIG. 20

NO. 1A COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	ABOVE	BOTTOM	3RD	49		.010"	.016"
C	TOP	COINCIDE	BOTTOM	51ST	49	.004"		.004"
P	TOP	BELOW	BOTTOM	EACH-SEGMENT	24 & 74	§		§
	BOTTOM	ABOVE	TOP		49 & 99	NO. 49 & 99		NO. 24 & 74
T	BOTTOM	ABOVE	BOTTOM	-	0			§
	TOP	BELOW	TOP	-	99	NO. 0		NO. 99
R S	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99	§	EQUAL	§
	BOTTOM	ABOVE	TOP					

NO. 1A COMMUTATOR (WHEN USED WITH NON-REPEATING INCOMING CIRCUITS)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	TOP	COINCIDE	TOP	3RD	49	.004"		.004"
C	TOP	COINCIDE	BOTTOM	51ST	49	.004"		.004"
P	TOP	BELOW	BOTTOM	EACH SEGMENT	24 & 74	§		§
	BOTTOM	ABOVE	TOP		49 & 99	NO. 49 & 99		NO. 24 & 74
T	BOTTOM	ABOVE	BOTTOM	-	0			§
	TOP	BELOW	TOP	-	99	NO. 0		NO. 99
R S	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99	§	EQUAL	§
	BOTTOM	ABOVE	TOP					

NO. 1A COMMUTATOR (WHEN USED WITH REPEATING INCOMING CIRCUITS)

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" can be used as a reference.

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

§ Spring shall not touch segment. † Spring shall not touch insulation.

INCOMING FRAMES

FIG. 21

NO. 1A COMMUTATOR

FIG. 22

NO. 3A COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX.LOW	IDEAL	MAX.HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	ABOVE	BOTTOM	3RD	49	.010"	.010"	.010"
C	TOP	COINCIDE	BOTTOM	51ST	49	.004"		.004"
P	TOP	BELOW	BOTTOM	EACH SEGMENT	24 & 74	§		§
	BOTTOM	ABOVE	TOP		49 & 99	NO.49 & 99		NO.24 & 74
T	BOTTOM	ABOVE	BOTTOM	-	0	†		†
	TOP	BELOW	TOP	-	99	NO.0		NO.99
R S	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99	§	EQUAL	§
	BOTTOM	ABOVE	TOP			†		†

NO. 3A COMMUTATOR (WHEN USED WITH NON-REPEATING INC. CIRCUITS)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX.LOW	IDEAL	MAX.HIGH
A	BOTTOM	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	TOP	COINCIDE	TOP	3RD	49	.004"		.004"
C	TOP	COINCIDE	BOTTOM	51ST	49	.004" NO.1		.004"
P	TOP	BELOW	BOTTOM	EACH SEGMENT	24 & 74	§		§
	BOTTOM	ABOVE	TOP		49 & 99	NO.49 & 99		NO.24 & 74
T	BOTTOM	ABOVE	BOTTOM	-	0	†		†
	TOP	BELOW	TOP	-	99	NO.0		NO.99
R S	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99	§	EQUAL	§
	BOTTOM	ABOVE	TOP			†		†

NO. 3A COMMUTATOR (WHEN USED WITH REPEATING INC. CIRCUITS)

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the eight plate.

§ Spring shall not touch segment.

† Spring shall not touch insulation.

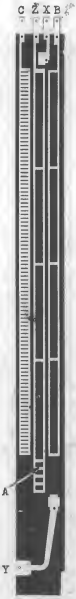


FIG. 23

NO. 3A COMMUTATOR

INCOMING FRAME

FIG. 24

NO. 3J COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	ABOVE	BOTTOM	3RD	49		.010"	.016"
C	TOP	COINCIDE	BOTTOM	51ST	49	.004"		.004"
P	TOP	BELOW	BOTTOM	-	74	§		§
	BOTTOM	ABOVE	TOP	-	99	NO. 99		NO. 74
T	BOTTOM	ABOVE	BOTTOM	-	0	†		†
	TOP	BELOW	TOP	-	99	NO. 0		NO. 99
R S	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99	§	EQUAL	§
	BOTTOM	ABOVE	TOP			†		†

NO. 3J COMMUTATOR (WHEN USED WITH NON-REPEATING INCOMING CIRCUITS)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	TOP	COINCIDE	TOP	3RD	49	.004"		.004"
C	TOP	COINCIDE	BOTTOM	51ST	49	.004"		.004"
P	TOP	BELOW	BOTTOM	-	74	§		§
	BOTTOM	ABOVE	TOP	-	99	NO. 99		NO. 74
T	BOTTOM	ABOVE	BOTTOM	-	0	†		†
	TOP	BELOW	TOP	-	99	NO. 0		NO. 99
R S	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99	§	EQUAL	§
	BOTTOM	ABOVE	TOP			†		†

NO. 3J COMMUTATOR (WHEN USED WITH REPEATING INCOMING CIRCUITS)

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the eight plate.

§ Spring shall not touch segment. † Spring shall not touch insulation.

‡INCOMING FRAMES

FIG. 25

NO. 3J COMMUTATOR

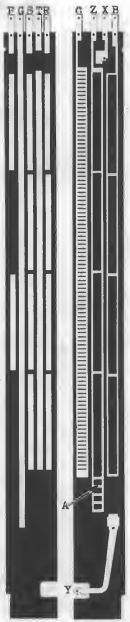


FIG. 26 FIG. 27

NO. 3K COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	COINCIDE	TOP	5TH	SEE NOTE B BELOW	.004"		.004"
B	BOTTOM	COINCIDE	BOTTOM	3RD	48	.004"		.004"
C	TOP	COINCIDE	BOTTOM	50TH	48	.004"		.004"
P	TOP	BELOW	BOTTOM	-	24 & 74	§		§
	BOTTOM	ABOVE	TOP	-	49 & 99	MAX. 49 & 99		MIN. 24 & 74
T	BOTTOM	ABOVE	BOTTOM	-	0	†		†
	TOP	BELOW	TOP	-	99	NO. 0		NO. 99
R S	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99	§	EQUAL	§
	BOTTOM	ABOVE	TOP					

NO. 3K COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	COINCIDE	TOP	5TH	SEE NOTE B BELOW	.004"		.004"
B	BOTTOM	COINCIDE	BOTTOM	3RD	48	.004"		.004"
C	TOP	COINCIDE	BOTTOM	50TH	48	.004"		.004"
P	TOP	BELOW	BOTTOM	-	74	§		§
	BOTTOM	ABOVE	BOTTOM	-	99	NO. 99		NO. 74
T	BOTTOM	ABOVE	BOTTOM	-	0	†		†
	TOP	BELOW	TOP	-	99	NO. 0		NO. 99
R S	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99	§	EQUAL	§
	BOTTOM	ABOVE	TOP					

NO. 5L COMMUTATOR

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .018" for solid 14 type brush springs) can be used as a reference.

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

§ Spring shall not touch segment. † Spring shall not touch insulation.

INCOMING FRAMES

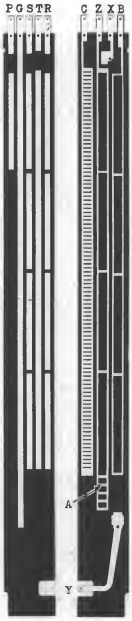


FIG. 28 FIG. 29

NO. 5L COMMUTATOR

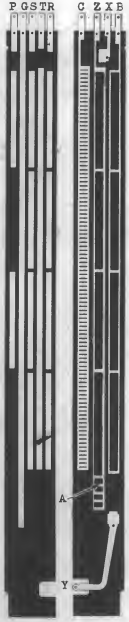


FIG. 30 FIG. 31

NOS. 3N AND 3AF COMMUTATORS

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	TOP	COINCIDE	TOP	3RD	49	.004"		.004"
C	TOP	COINCIDE	BOTTOM	51ST	49	.004"		.004"
P	TOP	BELOW	BOTTOM	-	24 & 74	§ NO. 49 & 99		§ NO. 24 & 74
	BOTTOM	ABOVE	TOP	-	49 & 99			
T	BOTTOM	ABOVE	BOTTOM	-	0	† NO. 0		† NO. 99
	TOP	BELOW	TOP	-	99			
R S	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99	§	EQUAL	§
	BOTTOM	ABOVE	TOP					

NOS. 3N AND 3AF COMMUTATORS (WHEN USED WITH REPEATING INC. CIRCUITS)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	COINCIDE	TOP	5TH	SEE NOTE B BELOW	.004"		.004"
B	BOTTOM	COINCIDE	BOTTOM	3RD	48	.004"		.004"
C	TOP	COINCIDE	BOTTOM	50TH	48	.004"		.004"
P	TOP	BELOW	BOTTOM	-	24 & 74	§ NOS. 49 & 99		§ NO. 24 & 74
	BOTTOM	ABOVE	TOP	-	49 & 99			
T R	BOTTOM	ABOVE	BOTTOM	-	0	† NO. 0		† NO. 99
	TOP	BELOW	TOP	-	99			
S	TOP	BELOW	BOTTOM	EACH SEGMENT	24, 49, 74 & 99	§	EQUAL	§
	BOTTOM	ABOVE	TOP					

NO. 3W (FORMERLY D-44660), 3AE AND 3AG COMMUTATORS

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

§ Spring shall not touch segment. † Spring shall not touch insulation.

INCOMING FRAMES

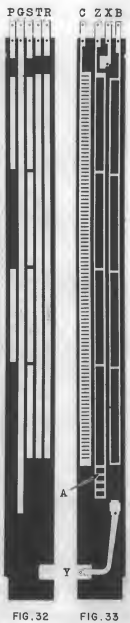


FIG. 32 FIG. 33

NOS. 3W, 3AE AND 3AG COMMUTATORS

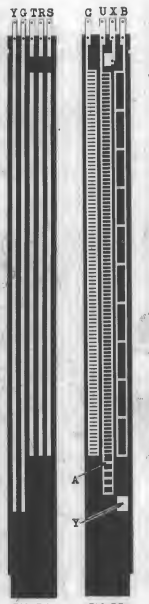


FIG. 34 FIG. 35

NO. 1B COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS. SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	ABOVE	BOTTOM	6TH	49	.016"	.024"	.032"
C	TOP	ABOVE	TOP	50TH	49	.004"	.008"	.012"
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO. 0		NO. 99
	TOP	BELOW	TOP	-	99			

NO. 1B COMMUTATOR (USED IN GROUND C.O. OFFICE)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	ABOVE	BOTTOM	6TH	49	.016"	.024"	.032"
C	TOP	ABOVE	TOP	50TH	49	.004"	.008"	.012"
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO. 0		NO. 99
	TOP	BELOW	TOP	-	99			

NO. 3B COMMUTATOR (USED IN GROUND C.O. OFFICE)

Note A: As an aid in meeting these limits, the brush springs may be used as a reference. The thickness of the 10 and 14 type brushes used respectively for 1 and 3 type commutators is approx. .016" except for the solid brush spring of 14 type brushes which is approx. .012"

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

I Spring shall not touch insulation.

FINAL FRAMES

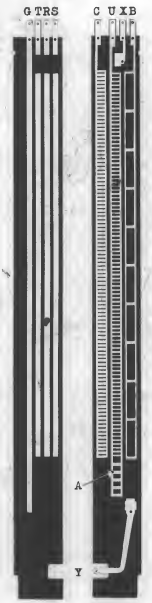


FIG. 36 FIG. 37

NO. 3B COMMUTATOR.

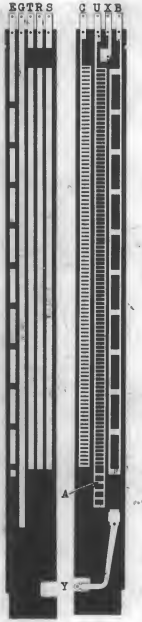


FIG. 38 FIG. 39

NO. 3G COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	COINCIDE	BOTTOM	6TH	48	.004"		.004"
C	TOP	ABOVE	TOP	49TH	48	.004"	.008"	.012"
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO. 0		NO 99
	TOP	BELOW	TOP	-	99			

NO. 3G COMMUTATOR (SEE NOTE C BELOW) (USED IN GROUND C.O. OFFICE)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	COINCIDE	BOTTOM	6TH	48	.004"		.004"
C	TOP	ABOVE	TOP	49TH	48	.004"	.008"	.012"
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO. 0		NO 99
	TOP	BELOW	TOP	-	99			

NO. 3M COMMUTATOR (USED IN GROUND C.O. OFFICE)

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

Note C: Requirements are not specified for the "E" segment of the 3G commutator as it has no circuit function.

†Spring shall not touch insulation.

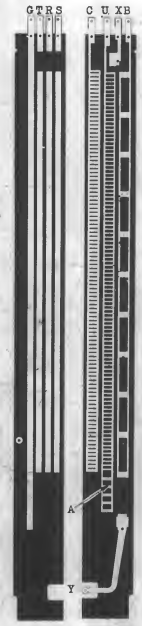


FIG. 40 FIG. 41

NO. 3M COMMUTATOR

4673

Reference segment for adjusting purposes.

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	BOTTOM	COINCIDE	TOP	5TH	SEE NOTE B BELOW	.004"		.004"
B	BOTTOM	COINCIDE	BOTTOM	6TH	48	.004"		.004"
C	TOP	COINCIDE	TOP	49TH	48	.004"		.004"
E	BOTTOM	COINCIDE	BOTTOM	7TH	48	.004"		.004"
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO. 0		NO. 99
	TOP	BELOW	TOP	-	99			

NOS. 3P AND 3AD COMMUTATORS (USED IN BATTERY C.O. OFFICE)

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

†Spring shall not touch insulation.

FIG. 42
NOS. 3P AND 3AD COMMUTATORS

FIG. 43
NOS. 3P AND 3AD COMMUTATORS

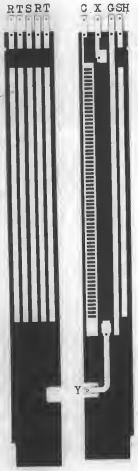


FIG.44 FIG.45

NO. 3C COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX.LOW	IDEAL	MAX.HIGH
C	TOP	COINCIDE	BOTTOM	34TH	32	.004"		.004"
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO.0		
	TOP	BELOW	TOP	-	64			
SH (Sometimes designated "S")	The bottom edge of the "SH" spring shall make contact with its feeder segment approximately .015" before the "C" spring breaks contact with its first segment.							

NO. 3C COMMUTATOR (USED WITH 65 TERMINAL BANKS)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX.LOW	IDEAL	MAX.HIGH
C	TOP	COINCIDE	BOTTOM	51ST	49	.004"		.004"
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO.0		
	TOP	BELOW	TOP	-	99			
SH (Sometimes designated "S")	The bottom edge of the "SH" spring shall make contact with its feeder segment approximately .015" before the "C" spring breaks contact with its first segment.							

NO. 3E COMMUTATOR (USED WITH 100 TERMINAL BANKS)

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

†Spring shall not touch insulation.

POSITION DISTRIBUTING OR CORDLESS "B" LINK FRAMES

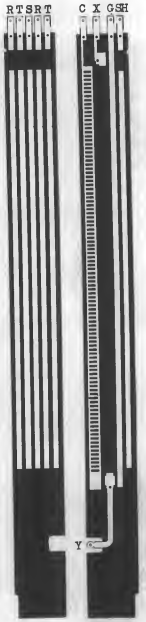


FIG.46 FIG.47

NO. 3E COMMUTATOR

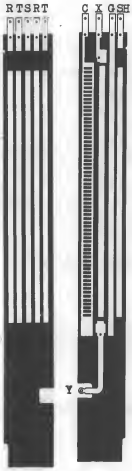


FIG. 48 FIG. 49

NO. 3R COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	TOP	COINCIDE	BOTTOM	34TH	32	.004"		.004"
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO.0		
	TOP	BELOW	TOP	-	64			
SH (Sometimes designated "S")	The bottom edge of the "SH" spring shall make contact with its feeder segment approximately .015" before the "C" spring breaks contact with its first segment.							

NO. 3R COMMUTATOR (USED WITH 65 TERMINAL BANKS)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	TOP	COINCIDE	BOTTOM	51ST	49	.004"		.004"
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO.0		
	TOP	BELOW	TOP	-	99			
SH (Sometimes designated "S")	The bottom edge of the "SH" spring shall make contact with its feeder segment approximately .015" before the "C" spring breaks contact with its first segment.							

NO. 3S COMMUTATOR (USED WITH 100 TERMINAL BANKS)

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .013" for solid 14 type brush springs) can be used as a reference.

†Spring shall not touch insulation.

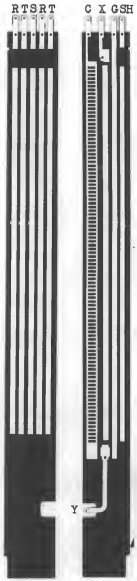


FIG. 50 FIG. 51

NO. 3S COMMUTATOR

POSITION DISTRIBUTING OR CORDLESS "B" LINK FRAMES

FIG. 52 FIG. 53

NO. 3U COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	BOTTOM	COINCIDE	TOP	50TH	49	.004		.024"
T, R, TR, SC, FT & FR	BOTTOM	ABOVE	BOTTOM	-	0	NO.0		NO. 99
	TOP	BELOW	TOP	-	99			
X	BOTTOM	ABOVE	BOTTOM	-	101			
Z	BOTTOM	ABOVE	BOTTOM	Z	90	NO. 90		NO.89
	TOP	BELOW	TOP	Z1	89			

NO. 3U COMMUTATOR (SENDER SELECTOR)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	BOTTOM	COINCIDE	TOP	31ST	30	.004"		.004"
N	TOP	BELOW	TOP	-	59	.004" 104-A GAUGE	104-A GAUGE	.004" 104-A GAUGE
KK	BOTTOM	ABOVE	BOTTOM	-	61	.024"	.032"	.031"
	BOTTOM	ABOVE	TOP	-	SEE NOTE B BELOW	.032"		
	BOTTOM	ABOVE	TOP	-	0	.016"		
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO.0		NO.59
	TOP	BELOW	TOP	-	59			
H M	TOP	BELOW	BOTTOM	-	SEE NOTE B BELOW			.042"

NOS. 10A AND 10B COMMUTATORS (TRUNK-FINDER)

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

Note B: The H, M and K springs shall be checked with the brush rod resting on the down stop collar and after all other springs have been adjusted.

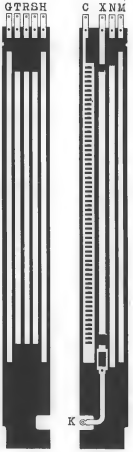


FIG. 54 FIG. 55

NOS. 10A and 10B COMMUTATORS

CALL DIST. "B" LINK FRAMES

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	TOP	BELOW	BOTTOM	30TH	18	± .024"	.018"	.012"
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO 0		NO. 39
	TOP	BELOW	TOP	-	39			NO. 39
H	TOP	BELOW	TOP	-	39			NO. 39

NO. 4A COMMUTATOR (USED WITH SUBSCRIBER SENDERS)

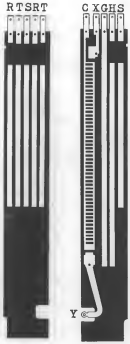


FIG. 56 FIG. 57

NO. 4A COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	ABOVE	TOP	3RD	16	.008"	.020"	.032"
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO. 0		NO. 39
	TOP	BELOW	TOP	-	39			

NO. 4B COMMUTATOR (USED WITH TANDEM SENDERS)

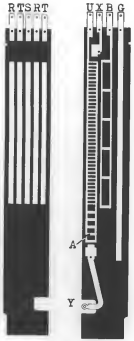


FIG. 58 FIG. 59

NO. 4B COMMUTATOR

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

†Spring shall not touch insulation.

TRANSLATOR FRAMES

FIG. 60

NO. 4C COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
A	TOP	ABOVE	TOP	5TH	SEE NOTE B BELOW	.004"	.010"	.016"
B	BOTTOM	ABOVE	TOP	3RD	16	.008"	.020"	.032"
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO. 0		NO. 39
	TOP	BELOW	TOP	-	39			

NO. 4C COMMUTATOR (USED WITH TANDEM SENDERS)

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

Note B: Check or adjust the "A" spring with the index number 0 on the rack just below the sight plate.

†Spring shall not touch insulation.

FIG. 61

NO. 4C COMMUTATOR

TRANSLATOR FRAMES

FIG. 62

NOS. 2A AND 2B
COMMUTATORS

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	TOP	ABOVE	TOP	10TH	9	.008"	.012"	.016"
N	BOTTOM	ABOVE	TOP	-	20	.012"	.016"	.024"
KK	BOTTOM	ABOVE	BOTTOM	-	20	.024"	.032"	.032"
	BOTTOM	ABOVE	TOP	-	SEE NOTE B BELOW	.012"		
	BOTTOM	ABOVE	TOP	-	0	.016"		
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO.0		NO 19 .032"
	TOP	BELOW	TOP	-	19			
H M	TOP	BELOW	BOTTOM	-	SEE NOTE B BELOW			.032"

NOS. 2A AND 2B COMMUTATOR (USED WITH 20-TERMINAL BANKS - 300-POINT LINE FINDERS)

FIG. 63

NOS. 2A AND 2B
COMMUTATORS

Note A: As an aid in meeting these limits the thickness of the springs, approximately 0.016 inch (approximately 0.012 inch for solid 14-type brush springs), can be used as a reference.

Note B: The H, M, and K springs shall be checked with the brush rod resting on the down stop collar and after all other springs have been adjusted.

Note C: Where circuits are not provided with contact protection for the M and G segments, the M spring may be crimped as covered in 3.07(20). Crimping lowers the M spring an additional 0.055 inch. The C spring may also be grounded as covered in 3.07(20).

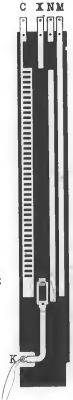
†Spring shall not touch insulation.

LINE FINDER FRAMES

FIG. 64
NOS. 5A AND 5B
COMMUTATORS

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	BOTTOM	COINCIDE	TOP	21ST	20	.004"		.055"
N	TOP	BELOW	TOP	-	39	.004" DANGER	.008"	.055" DANGER
KK	BOTTOM	ABOVE	BOTTOM	-	41	.014"	.032"	.055"
	BOTTOM	ABOVE	TOP	-	SEE NOTE B BELOW	.034"		
	BOTTOM	ABOVE	TOP	-	0	.010"		
T R S	BOTTOM	ABOVE	BOTTOM	-	0	NO.0		NO.39
	TOP	BELOW	TOP	-	39			
H M	TOP	BELOW	BOTTOM	-	SEE NOTE B BELOW			.027"

NOS. 5A AND 5B (FORMERLY D-76821) COMMUTATORS (USED WITH 40-TERMINAL 400-POINT LINE AND TRUNK FINDERS)



See Note C

FIG. 65
NOS. 5A AND 5B
COMMUTATORS

Note A: As an aid in meeting these limits the thickness of the springs, approximately 0.016 inch (approximately 0.012 inch for solid 14-type brush springs), can be used as a reference.

Note B: The H, M, and K springs shall be checked with the brush rod resting on the down stop collar and after all other springs have been adjusted.

Note C: Where circuits are not provided with contact protection for the M and G segments, the M spring may be crimped as covered in 3.07(20). Crimping lowers the M spring an additional 0.055 inch. The C spring may also be grounded as covered in 3.07(20).

†Spring shall not touch insulation.

FIG. 66 NO. 3U COMMUTATOR

SPRING			SEGMENT		BACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW	
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX.-LOW IDEAL	MAX.-HIGH
C	BOTTOM	COINCIDE	TOP	50TH	49	.004"	.004"
T, R, FR, FT, FR & TR	BOTTOM	ABOVE	BOTTOM	-	0	NO. 0	.019"
	TOP	BELOW	TOP	-	99		
X	BOTTOM	ABOVE	BOTTOM	-	101		
Z	BOTTOM	ABOVE	BOTTOM	Z	90	NO. 90	NO. 89
	TOP	BELOW	TOP	Z1	89		

NO. 3U COMMUTATOR (SENDER SELECTOR)

FIG. 68 NO. 6A COMMUTATOR

FIG. 69

SPRING			SEGMENT		BACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW	
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX.-LOW IDEAL	MAX.-HIGH
C	BOTTOM	ABOVE	TOP	11TH	10	.004"	.004"
T, R, FR, FT, FR & SC	BOTTOM	ABOVE	BOTTOM	-	0	NO. 0	NO. 21
	TOP	BELOW	TOP	-	21		
X	BOTTOM	ABOVE	BOTTOM	-	23		

NO. 6A COMMUTATOR (22 TERMINAL DISTRICT FINDER)

Note A: As an aid in meeting these limits the thickness of the springs, approx. .013" (approx. .012" for solid 14 type brush springs) can be used as a reference.

†Spring shall not touch insulation.

SUNSCRIBERS LINK FRAMES

Fig. 66, 67, 68, 69—Subscribers Link Frames (No. 6A Commutator 22 Terminal District Finder)

FIG. 70

NO. 7A COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	BOTTOM	ABOVE	TOP	21ST	20		.004"	.006"
T, R, TR, FT, FR & SC	BOTTOM	ABOVE	BOTTOM	-	0	F† T No. 0		.006"
	TOP	BELOW	TOP	-	41			
X	BOTTOM	ABOVE	BOTTOM	-	43	† T		

NO. 7A COMMUTATOR (42 TERMINAL DISTRICT FINDER)

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

†Spring shall not touch insulation.

FIG. 71

NO. 7A COMMUTATOR

SUBSCRIBERS LINK FRAMES

Fig. 70 and 71—Subscribers Link Frames (No. 7A Commutator 42 Terminal District Finder)

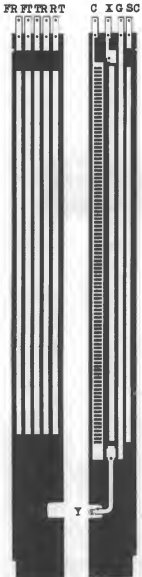


FIG. 72 FIG. 73

NO. 3S COMMUTATOR

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	TOP	COINCIDE	BOTTOM	51ST	49	.004"		.004"
T, R, FT, FR SC	BOTTOM	ABOVE	BOTTOM	-	0	NO. 0		NO. 99
	TOP	BELOW	TOP	-	99			
	TOP	BELOW	TOP	-	99			NO. 93
TR	The bottom edge of the "TR" spring shall make contact with its feeder segment approximately .015" before the "C" spring breaks contact with its first segment.							

NO. 3S COMMUTATOR (TRUNK FINDER)

SPRING			SEGMENT		RACK NOTCH NUMBER	TEST AND READJUST LIMITS SEE NOTE A BELOW		
DESIG.	EDGE	POSITION	EDGE	NUMBER		MAX. LOW	IDEAL	MAX. HIGH
C	BOTTOM	COINCIDE	TOP	50TH	49	.004"		.004"
T, R, TR, SC, FT & FR	BOTTOM	ABOVE	BOTTOM	-	0	NO. 0		NO. 99
	TOP	BELOW	TOP	-	99			
X	BOTTOM	ABOVE	BOTTOM	-	101			
Z	BOTTOM	ABOVE	BOTTOM	Z	90	NO. 90		NO. 89
	TOP	BELOW	TOP	Z1	89			

NO. 3U COMMUTATOR (SENDER SELECTOR)

Note A: As an aid in meeting these limits the thickness of the springs, approx. .016" (approx. .012" for solid 14 type brush springs) can be used as a reference.

†Spring shall not touch insulation.

SENDER TANDEM LINK FRAMES

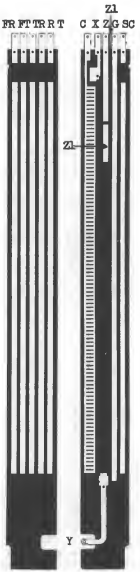


FIG. 74 FIG. 75

NO. 3U COMMUTATOR

3. ADJUSTING PROCEDURES

3.001 ***List of Tools and Gauges***

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
206	30-degree Offset Screwdriver
207	90-degree Offset Screwdriver
220	3/16-inch Hex. Socket Wrench
224	Spring Adjuster
308	Brush Spring Crimper
619A	Adjuster
621A	Spreader
KS-2632	Reading Glass
KS-6320	Orange Stick
R-1051	6-inch Pillar File
—	3-inch Cabinet Screwdriver
—	6-1/2-inch P-Long-nose Pliers
P-475817 or equivalent as required	Shell (Shell of a No. 309 plug)
GAUGES	
68B	70-0-70 Gram Gauge
104A	0.247-inch Thickness Gauge

3.002 Before checking for contact or wiper pad pressure or for clearance between brush springs and wiper holder, or before making any readjustments of a commutator brush of a link circuit having nontripping-type multiple brushes proceed as follows. Raise the brush rod until the multiple brush is in a position away from the brushes on the adjacent rods. Hold the shell of a No. 309 plug in a vertical position and insert it between the sleeve springs of the multiple brush and into the crook formed by the springs before the contact portion of springs so as to hold the brush shoes away from contact with the bank terminals. This operation may be facilitated if the KS-6320 orange stick is inserted into the hole of the plug shell and used as an aid in positioning the shell. After completing the necessary adjustments, remove the plug shell from the multiple brush.

3.003 ***Mounting and Removing No. 621A Spreader:*** (Fig. 76) — When a wiper holder is mounted on a brush and it is necessary to gain access to the brush springs to check requirements or make adjustments, mount the No. 621A spreader on the brush, as follows. Grasp the spreader by the triangular handles and position the legs of the spreader above the wiper holder with the stop of the spreader resting against the front edge of the commutator. Press the triangular handles together so that the tips of the legs are flat against the commutator. Slide the spreader downward until the top offset portion of the leg tips rest against the pad holder. Release the pressure on the triangular handles. To remove the spreader, proceed as follows. Press the triangular handles together so that the tips of the legs lie flat against the commutator. Slide the spreader upward until the legs are free of the pads, and then release the pressure on the handles and remove the spreader.

3.004 Where a commutator brush is equipped with a wiper holder and it is necessary to adjust a contact tip of a contact spring using the No. 224 spring adjuster, mount the No. 621A spreader as covered in 3.003 before making the adjustment.

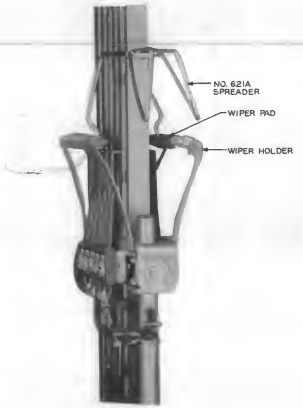


Fig. 76 – No. 621A Spreader Mounted in Position on Commutator

3.01 ***Cleaning and Treating*** (Rq 2.01)

(1) When necessary, clean and treat the commutator as covered in ▶Section 069-610-801.◀ Do not use oiled cloths on commutators equipped with wiper pads.

(2) When it is necessary to replace a wiper pad, proceed as covered in Section 026-120-801.

3.02 ***Commutator Mounting*** (Rq 2.02)

(1) If there is side or endplay at the top latch plate, loosen the latch plate mounting screws with the 3-inch cabinet screwdriver and remove the latch plate and slightly flatten it with the P long-nose pliers. Remount the latch plate and securely tighten the screws.

(2) If there is endplay in the bottom locating plate, it will be necessary to remove the commutator and adjust the retaining spring.

(3) To do this, raise the brush rod about half way. Loosen the latch plate mounting screws with the 3-inch cabinet screwdriver and remove the latch plate. Pull the top of the commutator away from the top commutator locating plate sufficiently to disengage the notch. Then raise the commutator enough to allow adjustment of the retaining spring.

(4) Adjust the retaining spring forward, as required, with the fingers so as to make a snug fit when the commutator is in place.

(5) Lower the commutator into the slot in the lower commutator mounting plate. Remount the latch plate and securely tighten the mounting screws.

(6) Make an inspection of the commutator wiring to see that no wires have been broken.

(7) Recheck all adjustments on the commutator brush.

(8) Check that requirement 2.07 is met.

3.03 ***Commutator Brush Mounting*** (Rq 2.03)

(1) If scratches are noted on the commutator surface, the trouble may be due to the brush mounting screws protruding from the inner side of the brush frame. To correct, remove the commutator brush as covered in Section 026-120-801 and file off the protruding ends of the screws with th R-1051 file. Remove the filings that collect on the parts. Remount the brushes as covered in Section 026-120-801.

3.04 ***Spring Clearance (For Earlier Split Leaf Springs Only)*** (Rq 2.04)

(1) If bind is noted, loosen the spring assembly clamping screw with the No. 206 or No. 207 offset screwdriver. Heat the soldering lug and before the solder has cooled sufficiently to set, separate the leaves. Do this by shifting the leaf of the spring that is furthest away from the edge of the contact strip by means of the No. 224 spring adjuster.

(2) Set up the spring assembly clamping screw moderately tight and check the spring for its correct position against the commutator as covered in 3.05 to 3.07, inclusive.

(3) Securely tighten the assembly clamping screws, resolder the terminals to ensure a good connection if any solder has been removed, and check the spring for contact pressure as covered in 3.08.

3.05 ***Horizontal Position of Springs*** (Rq 2.05)

(1) If the clearance between the contact portion of a spring and the front or rear edge of a segment is not satisfactory, loosen the spring assembly screw with the No. 206 or No. 207 offset screwdriver and shift the spring to the front or rear, as required, until the desired clearance is obtained. Then set the assembly screw moderately tight.

(2) Check the spring for spring clearance and for vertical position against the commutator as covered in requirements 2.04 and 2.07, respectively. Then securely tighten the assembly clamping screw.

(3) If a brush spring cannot be shifted due to the soldered strap connecting the spring at fault with the other springs, unsolder the strap wire and loosen the spring assembly clamping screw with the No. 206 or No. 207 offset screwdriver. Shift the spring as required, set up the assembly screw moderately tight, and

then proceed as covered in (2). Resolder the wire strap.

(4) On some earlier commutators where the springs cannot be shifted to meet the requirement, proceed as follows. Remove the soldered strap wire between the C brush and the other brushes. Soften the brush insulator by placing a hot soldering copper on the clamping screw and hold the copper on the screw for approximately 2 minutes. Then with the soldering copper still on the screw, shift the position of the brush as required. Remove the copper and allow the screw to cool and then proceed as covered in (2). Resolder the strap wire in place.

3.06 ***Angle of Contact*** (Rq 2.06)

(1) When it is noted that the horizontal portion of the spring does not meet the face of the commutator within 1/64 inch of the point at which it would be perpendicular to the commutator strip, correct by adjusting the horizontal portion of the spring with the No. 224 spring adjuster as shown in Fig. 77 and 78 either up or down, as required, until it comes within the specified limits.

(2) After performing this operation check the spring for correct contact pressure as covered in 3.08. Also check the spring for position as covered in 3.07.

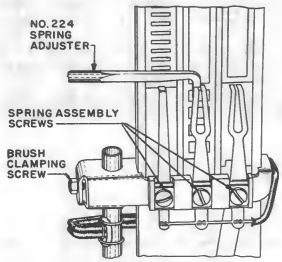


Fig. 77—Adjusting the Rear Leaf of a Brush Spring for Angle of Contact and Vertical Position

3.07 ***Vertical Position of Springs*** (Rq 2.07)

(1) ***General:*** In general, no gauges are specified for spring positions for which definite limits are specified. It should be possible to relocate the commutator brush quickly and accurately and to make the necessary adjustments of the contact portion of the individual springs comparing the limits specified in this specification with the thickness of the spring under adjustment. The commutator brush springs are approximately 0.016 inch (approximately 1/64 inch) thick with the exception of the solid 14-type brush springs which are approximately 0.012-inch thick. The KS-2632 reading glass may be used in connection with the visual inspection specified herein.

(2) ***Locating the Brush Assembly by Means of the Adjustment of the A or C Springs:*** The location of the commutator brush assembly, with respect to the reference notch of the associated rack, is determined by the setting of the A spring except where No. 2A, 2B, 3C, 3E, 3R, 3S, 3U, 4A, 5A, 5B, 6A, 7A, 10A, 10B, and D-76821 commutators are used. Where these commutators are used, the location of the commutator brush assembly, with respect to the reference notch of the associated rack, is determined by the setting of the C spring. If the brush assembly has been moved on the brush rod, as for example, if the assembly is replaced for any reason, or if the maximum adjustment permissible on an individual spring is not sufficient to bring it within the specified limits, thus requiring the movement of the entire brush assembly, locate the assembly with reference to the A or C spring.

(3) To do this, raise the brush rod by hand until the clutch pawl is engaged in the notch of the rack specified in the tables of limits.

(4) Make sure that the horizontal portion or lip of the A or C spring is as nearly as possible at right angles with the face of the commutator. If necessary, adjust the contact portion of the spring with the No. 224 spring adjuster until it is at right angles with the face of the commutator.

(5) Then loosen the commutator brush clamping screw with the No. 220 socket wrench sufficiently to permit the adjustment to be made by tapping the shank of the No. 220 wrench up or down with the handle of the screwdriver. The frame of the brush should not be tapped in making this adjustment as

this will be likely to mar the finish or distort some part of the assembly.

(6) When adjusting split or forked springs, tension or position each leaf of the spring individually.

(7) After adjusting either or both leaves of a split or forked spring, check that requirement 2.04 is met.

(8) If the spring does not meet the requirement for vertical position for the full width of the contact portion in the case of the C spring or for a point approximately in the middle of the contact portion of the spring in the case of other springs (of each leaf, in the case of a split spring or each half in the case of forked springs) it must be corrected.

(9) To accomplish this, bend the contact portion of the spring with the spring adjuster as shown in Fig. 77 and 78, as required, but be sure to keep within the 1/64-inch limits as covered in 3.06.

Individual Spring Adjustment

(10) Where it is impossible to adjust a spring up or down sufficiently to meet a requirement without bending the contact portion of the spring more than 1/64 inch or the thickness of the spring from a right angle with the surface of the commutator, adjust the contact portion of the spring to a right angle with the commutator, as covered in 3.06, loosen the spring assembly screw with the No. 206 or No. 207 offset screwdriver and move the spring up or down as necessary. When the adjustment is complete securely tighten the assembly screw.

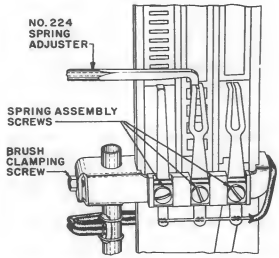


Fig. 78 – Adjusting the Front Leaf of a Brush Spring for Angle of Contact and Vertical Position

(11) If a spring has required a considerable amount of adjustment to meet the requirements for location against the commutator, the tension of the spring should be rechecked, and readjusted, if necessary, to the readjust limits. Also check that requirements 2.04 and 2.05 are met and readjust, if necessary.

Special Procedures

Adjustment of N Spring of Brushes Used With No. 5A, 5B, 10A, 10B, and D-76821 Commutators

(12) To check the N spring requirement on No. 5A, 5B, 10A, 10B, and D-76821 commutators, apply the No. 104A gauge on top of the spring and note that the top edge of the gauge coincides with the top edge of the segment within 0.004 inch.

Adjustment of the M and H Springs and the KX Spring at the K Segment of Brushes Used With No. 2A, 2B, 5A, 5B, 10A, 10B, and D-76821 Commutators

(13) If the H or M springs are only slightly out of adjustment, they may be adjusted in accordance with (10) and (11). The KX spring on the K segment may likewise be adjusted, if the brush setting at the X segment permits it.

(14) When either of the H or M springs, or the KX spring at the K segment cannot be adjusted in accordance with (10) and (11), it will be necessary to shift the downstop collar until the desired adjustment is obtained.

(15) After changing the downstop collar location, it will be necessary to recheck the settings of the T, R, and S springs. Also check multiple brush reset and trip finger adjustments in accordance with the section covering the type of elevator apparatus involved.

Adjustment of CW Spring on W Segment of No. 3T Commutators

(16) This requirement is met by raising the downstop collar on the brush rod. After obtaining the proper adjustment in this manner, check for multiple brush reset in accordance with Section 026-125-704 covering the selector elevator apparatus involved.

Adjustment of the SH (Sometimes designated S or TR) Spring of Brushes Used With No. 3C, 3E, 3R, and 3S Commutators

(17) Raise the brush rod until the C spring is about to break contact with its first segment. The bottom edge of the SH spring should then be approximately 0.015 inch above the bottom edge of its feeder strip. On drawings on which this spring is designated as S, the hunting S spring may be determined by checking the color of the wire attached to the sleeve spring of the hunting multiple brush which has bridging sleeve springs. If necessary, adjust in accordance with (10) and (11).

Crimping of B Spring of Brushes Used With the No. 3G Commutator Where Wiper Holder Is Not Furnished

(18) With the brush in the normal or down position, grasp the No. 308 brush spring crimper loosely in the right hand and introduce the straight jaw between the front spring of the brush and the right-hand side of the commutator about 1/8 inch below the contact portion of the spring. Holding the tool so that the jaw is parallel to the surface of the commutator, thrust it to the rear as far as it will go. Then lower it until its locating pin rests on the top of the frame, and its shoulder against the front edge of the commutator, as shown in Fig. 83. Holding it so that the jaws are horizontal, close the jaws steadily and firmly until the crimp is formed and the portion of the spring above the crimp lies in the same plane as the portion below it. Then proceed as covered in (10) and (11) to meet the location requirement specified.

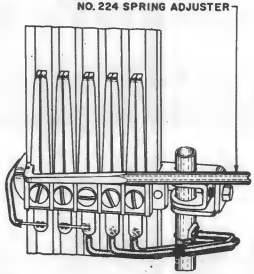


Fig. 79 – Adjusting the Rear Leaf of Split Leaf Brush Springs for Tension

Crimping of B Spring of Brushes Used With the No. 3G Commutator Where Wiper Holder Is Furnished

(19) Mount the No. 621A spreader, as covered in 3.003. Loosen the spring assembly clamping screw with the No. 206 and 207 offset screwdrivers and remove the spring. With the spring held in a horizontal position and with the contact tip down, grasp the No. 308 brush spring crimper loosely in the hand with the straight jaw down and insert the spring between the jaws so that the jaws are approximately 3/16 inch from the contact end of the spring and the spring lies within the crimping position of the tool. Hold the tool so that the jaws are at right angles to the longitudinal axis of the spring and close the jaws steadily and firmly to a complete stop so that the crimp is formed and the position to the right of the crimp lies in the same plane as the position to the left. Reassemble the spring and securely tighten the spring assembly screw. Remove the spreader as covered in 3.003. Then proceed as covered in (10) and (11) to meet the location requirement specified.

Adjustment of M Spring and Grounding of C Spring Used With No. 2A, 2B, 5A, and 5B Commutators on Line Finder and Trunk Finder Frames Where Circuit Is Not Provided With Contact Protection

(20) If pitting or burning of the M or G commutator segments is observed, crimp the M spring and ground the C spring as covered in Section 026-120-801.

3.08 *Contact Pressure* (Rq 2.08)

(1) Adjust springs, as required, using the No. 224 spring adjuster held as close to the clamping plate as possible, but not further away than as illustrated in Fig. 79 to 82, inclusive. To facilitate adjusting the tension of the forked-type spring, the spring may first be removed by loosening the spring assembly screw.

(2) Care must be used in tensioning springs to prevent them from being distorted or thrown out of adjustment. Make a recheck of the spring position adjustments to insure that the springs meet the requirements after the correct tension adjustment has been made.

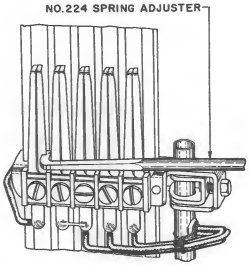


Fig. 80 – Adjusting the Front Leaf of the Earlier Type Split Leaf Brush Spring for Tension

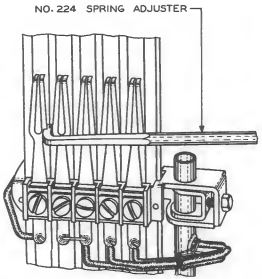


Fig. 82 – Adjusting the Front Leaf of the Forked-type Brush Spring for Tension

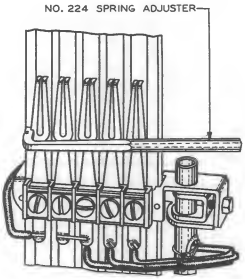


Fig. 81 – Adjusting the Rear Leaf of the Forked-type Brush Spring for Tension

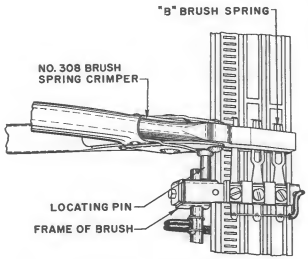


Fig. 83 – Crimping the B Spring With the No. 308 Brush Spring Crimper

3.09 ***Clearance Between Brush Springs and Wiper Holder*** (Rq 2.09)

(1) If the clearance between the tip of the commutator brush springs and the adjacent portion of the wiper holder is not satisfactory, proceed as follows. With the pad removed, adjust the wiper holder, as required, using the No. 619A adjuster placed just below the receptacle for the pad. It is permissible for the holder to tilt upward slightly, but ideally the top surface of the holder should be at right angles to the commutator. Where excessive tilt is necessary to clear all brush springs in accordance with the requirement, lower the individual springs or adjust the spring tips as covered in 3.07. After making this adjustment, check that the requirements covering vertical position of springs and contact pressure are met. Then remount the pad, as covered in Section 026-120-801.

3.10 ***Pressure of Wiper Pad Against Commutator*** (Rq 2.10)

3.11 ***Movement of Ends of Wiper Holder*** (Rq 2.11)

(1) If the pressure is not satisfactory and there is a movement of only one end at the wiper holder and the pressure of the wiper pad is near the maximum, reduce the tension in the leg adjacent to the end of the wiper holder having no movement. If the pressure is near the minimum, increase the tension in the leg adjacent to the end of the wiper holder where there is a movement. To do this, adjust the legs of the wiper holder with the No. 619A adjuster, as described below.

(2) To adjust the rear legs of the holder, position the adjuster so that the slot with the open end toward the handle is behind the rear leg and at the base of the leg as shown in Fig. 84. Rotate the adjuster to tension the leg, as required.

(3) To adjust the front legs of the holder, position the adjuster so that the slot with the open end away from the handle is in front of the leg and adjacent to the brush rod and at the base of the leg below the bend, as shown in Fig. 85. Rotate the adjuster to tension the leg, as required.

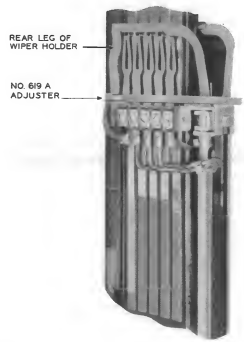


Fig. 84 – Method of Adjusting Rear Wiper Holder Leg

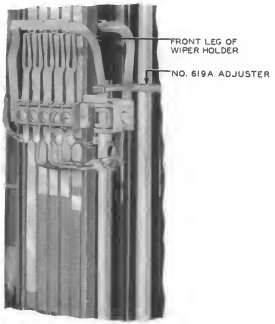


Fig. 85 – Method of Adjusting Front Wiper Holder Leg

(4) The bend in the leg is made during manufacture to provide initial tension and reduce the adjustment required in the field. When adjusting the legs, the tension of the front and rear legs should be approximately equal. This will provide movement at each end of the wiper holder which will insure that the pad pressure is uniformly distributed over the commutator surfaces.

(5) Lack of movement between the pad and the wiper holder may be due to interference between the wiper holder and the ends of the pad. In this case, remove the pad from the wiper holder and, with the fingers, reposition the fabric of the pad with respect to the channel to remove such interference.